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ABSTRACT

This study examines the relationship between mother-infant behavior and the infant's performance on perceptual-cognitive tasks as a function of the infant's sex. A total of 189 12-week-old infants and their mothers were observed in their homes during 2 hours of infant awake time. In addition, the Mental Development Index (MDI) of the Bayley Scales of Infant Development was administered to each child in his/her home and the Corman-Escalona Scales of Object Permanence and an attention task were conducted in the laboratory. Results showed that for middle class infants, males received somewhat more proximal behaviors than females while the reverse appeared to be the case for the lower class infants. The highest proportion of maternal interactive behavior, however, was found for mothers of lower SES males, while middle class mothers showed no interactive differences between males and females. Male infants were more responsive to their mother's interactions than female infants; however, there were few sex differences in infant behavior. Contrary to previous findings, males did not fret or cry significantly more than females. On the cognitive measures, a modality difference in habituation was evident on the attention task, but no sex differences were found for the Bayley MDI or object permanence performance. Data indicated a direct association between maternal behavior and infant perceptual-cognitive competence by 12 weeks of age with maternal interactive behavior showing an overall significant relationship and maternal frequency behavior showing different effects for male and female infants. (JMB)

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Gender Differences in the Relationship Between Mother-Infant Interaction and the Infant's Cognitive Development[1]

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Group differences have been studied for social class, ethnicity, gender and birth order. Claims to the contrary, these differences have, for the most part, been used to talk of difference qua difference rather than the processes that underline these specific differences. Too frequently, social class, gender, ethnicity and birth order differences are attributed to a combination of biological-maturational and genetic forces; thus, these biological explorations become the underlying processes. To the contrary, socialization explanations offer the view that observed differences are a function of differences in experience--be these reinforcement contingencies, cognitions or modeling experiences.

Very early differences as a function of these variables are often used as evidence for the biological viewpoint (Hutt, 1972) since experiential factors could be assumed to be a decreasing function of the age of the child. While Lewis, McGurk, Scott and Groch (1973) as well as Watson (1969) have found that female infants 12 weeks of age are more sensitive to auditory signals than boys, evidence exists to demonstrate that girls may be talked to more than boys (Moss, 1967; Lewis, 1972) or may be more talked to after they talk (voc-voc-contingency) by their mothers than boys (Lewis & Freedle, 1973). Thus, a very early sex difference in modality sensitivity may, in fact, be nothing more than a differential social experience. The issue remains unanswered and probably unanswerable in the form--"are these early sex differences attributable to

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learning or are they biological in nature"? A more interesting set of questions can be generated by looking directly at the socialization experience, observing a set of infant perceptual-cognitive skills and subsequently looking at the relationship between these two, paying close attention to sex differences as they may lend themselves to elucidating the process between socialization and perceptual-cognitive competence. Thus, it is not mean differences between the sexes, but the relationship between variables as a function of sex, that is of interest for this paper.

In the present study, 189, 12-week-old infants and their mothers were observed in their homes in order to obtain an estimate of the mother-infant relationship and the ongoing socialization process. In addition, three perceptual-cognitive tasks were administered to each child--including the Mental Developmental Index of the Bayley Scales of Infant Development, the Corman-Escalona Scales of Object Permanence and an attention task in both the visual and auditory modality.

Four specific questions were asked--the first three necessary for understanding the fourth:

1. Are there mean differences in maternal behaviors as a function of the infant's sex?
2. Are there mean differences in infant behaviors as a function of sex?
3. Are there mean differences in performance on the three perceptual-cognitive tasks or across modalities as a function of sex?
4. What is the relationship between mother-infant behavior and the infant's performance on the perceptual-cognitive tasks as a function of the infant's sex?

One further and rather important consideration was taken into account during this study. Since birth order, SES and sex differences have all been found to effect a wide variety of behaviors, it would seem necessary to control for these variables when focusing upon one separately. For example, if we are interested in sex differences, birth order and SES should be controlled or at least taken into consideration during the data analysis. Small sample sizes have precluded such observations. Moreover, most studies use one birth order status, usually first born, so there is relatively little data on the joint effects of these variables. The present study, designed to look at the effects of these variables, will discuss sex, SES and birth order differences when they appear. In the absence of any significant interactions,only the major effect of sex will be discussed since the effects of the other variables have been discussed elsewhere (Gallas & Lewis, 1976; Judd & Lewis, 1976; Lord & Lewis, 1976).

Procedure

Our procedure has been described in several earlier papers (Gallas & Lewis, 1976; Judd & Lewis, 1976); thus, we will only state that mother-infant observation took place in the home over 2 hours of infant awake time. The Bayley was obtained in the home while the object permanence and attention tasks were conducted in the laboratory.

Maternal Behavior. Thirteen different maternal behaviors were recorded and none showed significant main effect of sex. There were, however, sex by social class interactions. As has been reported by other investigators (Moss, 1967; Lewis, 1972) male infants, especially high SES males, received more proximal behaviors, including touching, holding and rocking.

Insert Figure 1 about here

As can be seen, middle class mothers engaged in these behaviors with their sons more often than with their daughters. However, for the lower class mothers, females received either more of these behaviors or there were no differences. These results again point up the fact that small sample sizes with restricted SES levels may lead to spurious results.

Maternal interactive data. For the sample as a whole, interactions as opposed to simple behavioral frequencies occurred in 15% of the 2 hours of observation time. Further, approximately 20% of the mother's behavior toward her infant was directly in interaction. Once again, sex and social class interacted such that mothers of lower SES males showed a higher proportion of interactive behavior than any other group ($F_{(1,137)} = 4.41$, $p < .05$). However, there were no differences between middle class mothers' interactive behavior toward their male and female infants (95 vs. 102). Thus, while middle class mothers showed more behavior directed toward their male infants as opposed to their female infants, interactive differences are nonexistent.

A more complex level of maternal-infant interaction can be obtained by looking at a specific infant behavior and specific maternal response. For example, particular attention has been paid to the infant-voc-mother-voc interaction (Lewis & Freedle, 1973). In our study, sex and social class again interacted such that high SES females received more voc-voc than high SES males (24 vs. 19, $p < .10$) while for the low SES infants, it was reversed (17 vs. 22, $p < .10$). Infant smile, in general, elicited more maternal response for male than female infants and included significant responses of voc ($p < .10$), look ($p < .10$) and smile ($p < .10$) in response.

Infant behavior. Although the mean data showed some consistent patterns with other reported data (Moss, 1967), (for example, male infants cried somewhat more often than female infants), there were few infant sex differences either as a main effect or in interaction with SES or birth order.

Infant Perceptual-Cognitive Performance

While both the Bayley MDI Scale and Corman-Escalona Scale of Object Permanence failed to show any sex differences, the object permanence task did indicate a birth order x SES x gender effect ($F_{(3, 130)} = 2.98$, $p < .03$).

Both an auditory and visual habituation-dishabituation task was given to each infant and heart rate response as well as fixation time (for the visual episode) were obtained. While males as opposed to females showed a greater decline in heart rate deceleration for the visual task, the female infants tended to show a greater decline in the auditory task ($F_{1, 164} = 3.04$, $p < .09$). These results could be used to support the notion that females are more sensitive to auditory signals while males are more sensitive to visual signals (Watson, 1969). With the exception of this modality difference, in general there were relatively few sex differences in performance on these perceptual-cognitive tasks.

Relationship between Maternal Variables and Infant Perceptual-Cognitive Performance

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Insert Figure 2 about here

Observation of the relationship between the specific frequencies of maternal behavior and the infant's perceptual-cognitive performance for the sample as a whole was rather disappointing. With the exception of bathing, no maternal variable was related to the infant's Bayley or attention performance and only the amount of toy giving was significantly related to the

infant's object permanence performance ($r = .18$, $p < .05$). This same finding has been reported previously with another large sample (Lee-Painter & Lewis, 1974).

We wish to note (see Figure 2) that while maternal frequency behavior and infant's perceptual-cognitive performance are relatively unrelated, the interactional data (such as total time in interaction) result in a significant relationship (maternal frequency behavior--MDI, $r = -.11$; maternal interaction--MDI, $r = .21$, $p < .01$); a finding reported recently on these and other data (Gallas & Lewis, 1977; Lewis & Coates, 1976).

The failure of the maternal frequency data to be related to the infant's perceptual-cognitive performance appears to be a result of the differences produced as a function of gender. When the male and female correlations were viewed separately, partialing for SES and birth order, significant associations between maternal behavior and infant performance emerged. Let us consider the infant's Bayley MDI score since the results are clearest for this measure. Figure 3 presents the correlations between specific maternal

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Insert Figure 3 about here

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behaviors and MDI score as well as the summed maternal behavior divided into proximal behaviors (for example: touching, holding, playing with subject, giving infant toy) and distal behaviors (for example: vocalizing, looking, smiling, watching television). In addition, when the mother-infant behaviors were factor analyzed, a distinct maternal social play factor emerged. In the great majority of cases, the more the mother touched, vocalized, smiled, and played with her female infant, the higher the child's Bayley MDI score; whereas the more behavior she exhibited toward her son the poorer the Bayley performance.

Similar results reflecting gender differences in the relationship between maternal behavior and infant cognitive performance have been reported by others (Bayley & Schaefer, 1964; Yarrow, Rubenstein, & Pedersen, 1975). Thus, we cannot conclude that this is a spurious result. Why should more maternal touching, playing, etc., be positively related to Bayley MDI scores for females and negatively related to Bayley MDI scores for males? Since the greatest differences occurred around the proximal behaviors, specifically touch, let us proceed to explore the gender differences between touch and MDI performance.

It is clear that touching can occur in different ways and for different reasons. We did not measure the different ways of touching although such an investigation would be interesting and probably quite revealing; Yarrow et al (1975) for example, looked at different forms of kinesthetic stimulation. At the moment, the most plausible explanation seems to be related directly to the state of the infant. Maternal touch is more related to infant crying for male infants ($r = .15$, $p < .10$) than for female infants ($r = .07$) and indicates that maternal touch is associated with an upset infant for males but not for females. One might expect that infants who are upset would score less well on the Bayley MDI than infants who were not, as in the case of these male infants. Unfortunately, the data only partially support this interpretation. First, there are no sex differences for amount of crying. Second, there is no relationship between the amount of infant crying either for males or females and the infant's performance on the Bayley MDI ($r = -.02$ males, $-.04$ females). Moreover, when one looks at the relationship between the Bayley MDI score and maternal touching in response to an infant cry, the same sex differences emerge; that is, there is a positive correlation for females ($r = .18$) and a negative correlation for males ($r = -.26$, $p < .01$). We would have expected

these specific correlations to be the same for both sexes if infant crying and sex differences in crying were causing the correlational difference with the Bayley MDI performance.

Alternatively, other reasons for touching an infant may account for the infant's poorer performance on the Bayley MDI. For example, if the general socialization process results in a decrease in touching for both sexes but a greater decrease for males than females (Lewis, 1972), the male infants who receive more touching may be "different" than girls who receive more touching. In a word, if touching girls is sex role stereotyped as appropriate then more touching would be considered "good", whereas if touching boys is sex role stereotyped as inappropriate then more touching would be considered "bad". Thus, mothers who touch their young male children a great deal of the time may also be those same mothers doing other things which may delay development. This is not a terribly appealing interpretation, since if touching is considered good, more touching should be considered even better. However, the differential correlations between the sexes suggest that behavior must be viewed in the context of the meaning of that behavior. Thus, touch qua touch is neither good nor bad but depends upon the underlying socialization process and the rules governing it; since over-protection as well as stimulation can be characterized, in part, by touching. Other explanations have been offered which suggest (1) different genetic maturational influences (Bayley & Schaffer, 1964) and (2) differences in socialization susceptibility (Yarrow et al, 1975). None of these explanations appear to satisfy the positive correlation for females and the negative correlation for males.

In conclusion we will readdress the four questions raised earlier:

1. Are there mean differences in maternal behavior as a function of the infant's sex?

There are maternal differences as a function of the infant's gender. These differences can be seen at the behavior frequency and interactional level. In general, sex differences interact with social class. At this age, for middle class infants, males receive somewhat more proximal behaviors than females while the reverse appears to be the case for the lower class infants. This difference, especially for the middle class, has been reported for different samples and appears to be a general finding, although social class differences should alert us to the problems of characterizing gender differences independent of other status variables (for example birth order and ethnicity).

2. Are there mean differences in infant behavior as a function of sex?

Male infants were more responsive to their mothers' interactions than female infants; however infant differences as a function of gender were minimal. Contrary to other findings, males did not fret or cry significantly more than females, although the mean data were in the expected direction.

3. Are there mean differences in performance on the three perceptual-cognitive tasks or across modalities as a function of sex?

No sex differences were found for the Bayley MDI or object permanence performance. A modality difference in habituation was evident, with female infants showing more responsivity to auditory stimuli and male infants showing more responsivity to visual stimuli--a gender difference found by others.

4. What is the relationship between mother-infant behavior and the infant's performance on the perceptual-cognitive tasks as a function of the infant's sex?

In general, interactional measures are more related to perceptual-cognitive performance than simple maternal behavior frequencies. When behavior frequencies are observed as a function of gender, an interesting result emerges which indicates that maternal behavior exhibited toward the female infant is directly associated with a superior MDI performance and is associated with a poorer MDI performance for male infants. Therefore, one must conclude that maternal behavior, independent of the causes or reasons for that behavior, can generate confusing and contradictory findings. That the same behavior (depending on the gender of the child) can be associated both positively and negatively with cognitive performance, indicates that we need to go beyond the behavioral level in order to explore the motives, beliefs and biases that influence overt behavior. Once having done this, we may be better able to assess the specific relationship between socialization practices and infants' perceptual-cognitive performance. Nevertheless, these data indicate a direct association between maternal behavior and infant perceptual-cognitive competence by 12 weeks of age.

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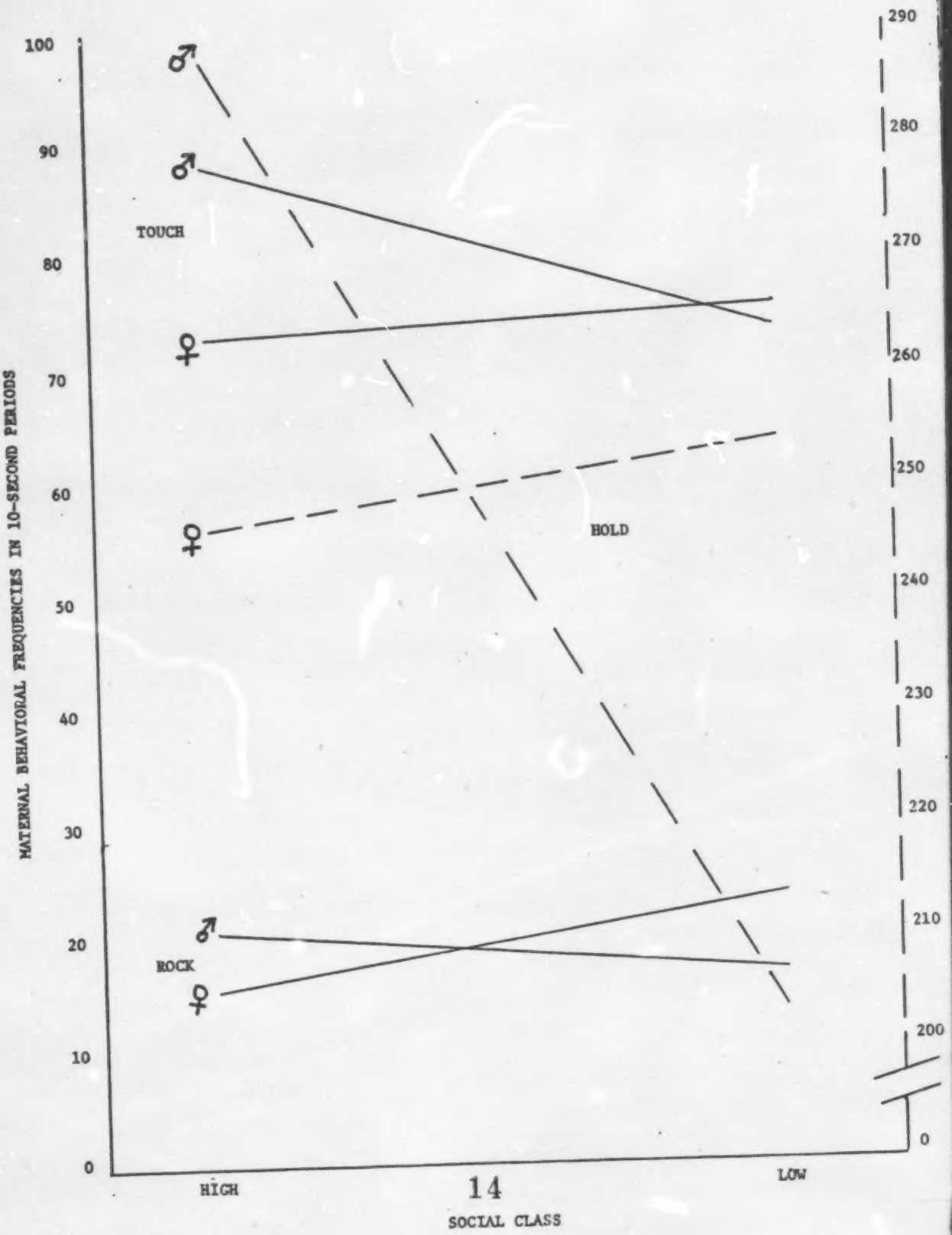

Figure 1: Sex X Social Class Interaction for Maternal Frequency Behaviors of Touching, Holding and Rocking.

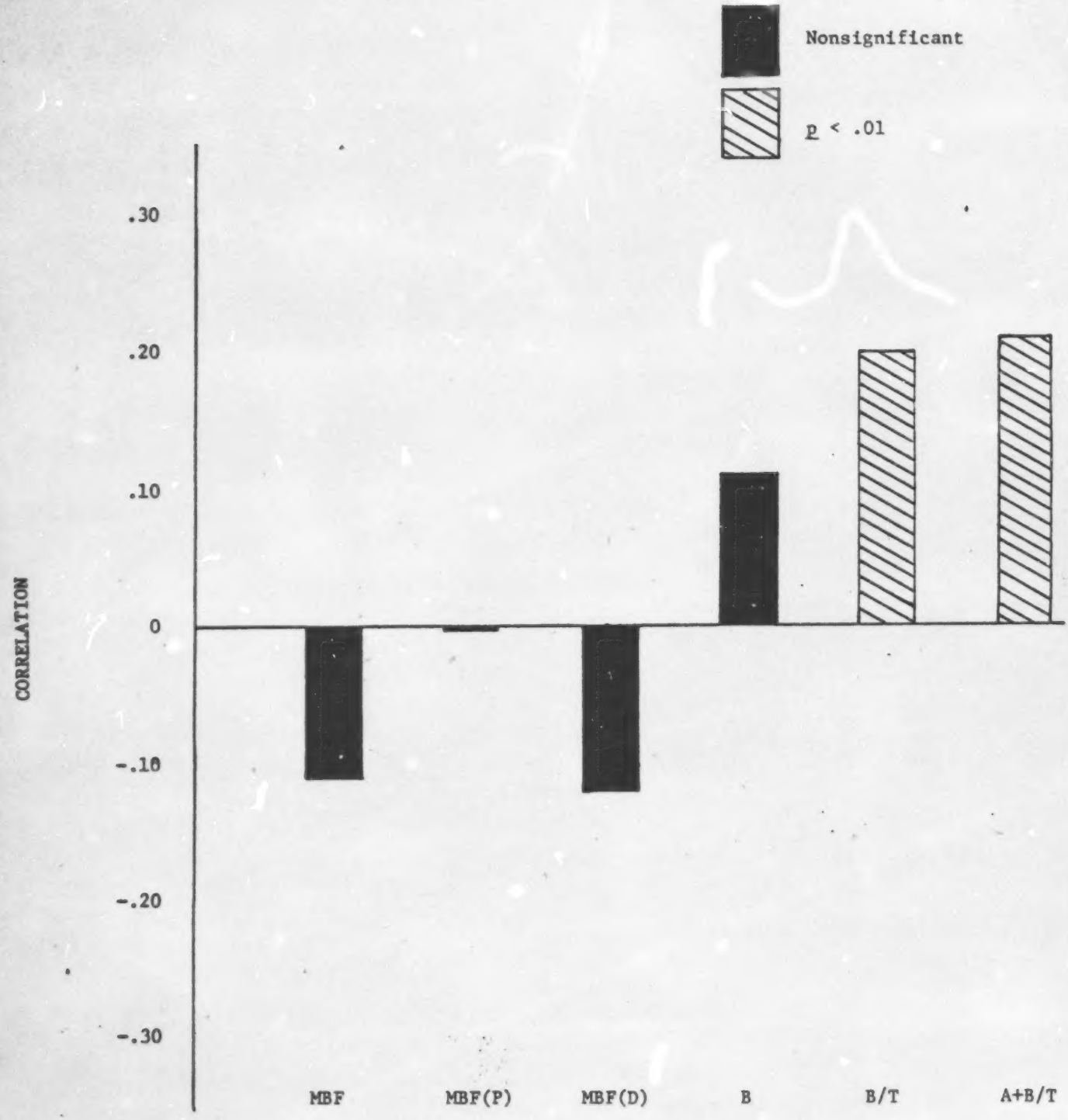

Figure 2: Correlation between Bayley MDI scores and maternal behavior.

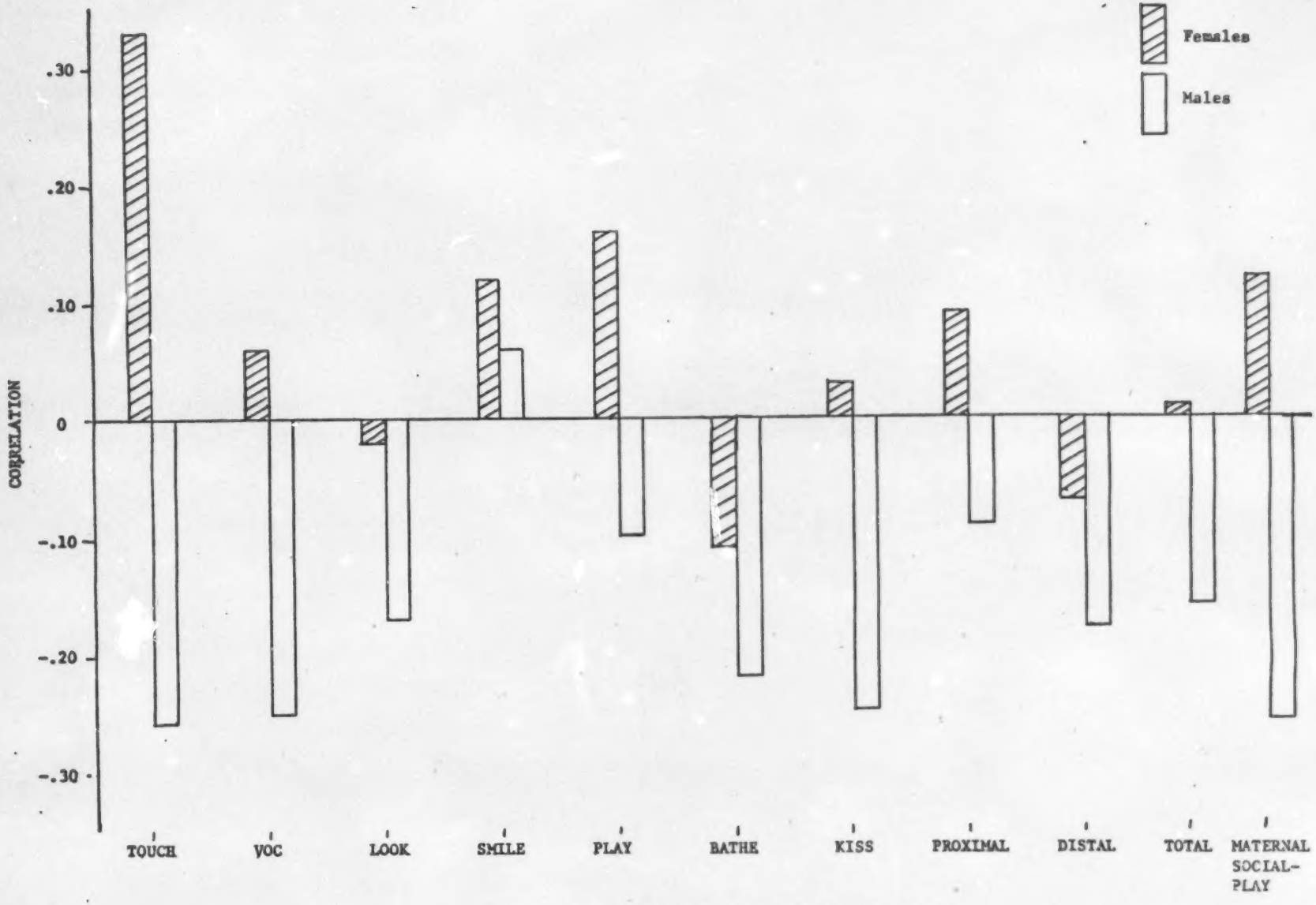

Figure 3: Correlation between Bayley MDI Scores and Maternal Frequency Behaviors as a Function of Gender.